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Proceedings of the regional peer review for developing a marine protected area network in the Western Arctic Bioregion – validating the process and identifying Priority Conservation Areas

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Winnipeg, MB

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

A Marine Protected Areas Network following United Nations stipulated steps is required to meet Canada's obligations to the United Nations Convention on Biological Diversity (UN CBD). The objective of the network will be to help conserve biodiversity, ecosystem functions and natural characteristics of the marine environment. Ecologically and Biologically Significant Areas (EBSA) have been identified for the Western Arctic Bioregion. The next step in the process is to identify ecological units derived from a biogeographic classification system. EBSAs and ecological units are used as inputs to identify priority conservation areas as planning inputs to the Marine Protected Areas Network.

Fisheries and Oceans Canada (DFO) held a regional science peer-review meeting on February 17-19, 2014 in Winnipeg, MB to evaluate a proposed classification system to produce ecological units and identify a conservation objective and priority conservation areas within the Western Arctic Bioregion.

This proceedings report summarizes the relevant discussions from the peer-review meeting and presents revisions to be made to the associated research documents. The Science Advisory Report and the supporting Research Documents, resulting from this advisory meeting, are published on the DFO Canadian Science Advisory Secretariat (CSAS) Website.

Compte rendu de l'examen régional par les pairs pour la création d'un réseau d'aires marines protégées (RAMP) dans la biorégion de l'ouest de l'Arctique – Validation du processus et désignation des aires de conservation prioritaires

SOMMAIRE

La mise en place d'un réseau d'aires marines protégées conformément aux étapes préconisées par les Nations Unies est impérative pour satisfaire aux obligations prises par le Canada dans le cadre de la *Convention sur la diversité biologique* des Nations Unies. L'objectif du réseau sera d'aider à préserver la biodiversité, les fonctions des écosystèmes et les caractéristiques naturelles du milieu marin. Des zones d'importance écologique et biologique (ZIEB) ont été délimitées dans la biorégion de l'ouest de l'Arctique. La prochaine étape du processus consiste à déterminer les unités écologiques, selon un système de classification biogéographique. Les ZIEB et les unités écologiques contribuent au processus en définissant les aires de conservation prioritaires comme des facteurs de planification du réseau d'aires marines protégées (RAMP).

Pêches et Océans Canada (MPO) a organisé une réunion régionale d'examen scientifique par les pairs du 17 au 19 février 2014 à Winnipeg (Manitoba). Cette réunion visait à évaluer un système de classification proposé, afin de définir des unités écologiques et d'établir un objectif de conservation ainsi que des aires de conservation prioritaires pour la biorégion de l'ouest de l'Arctique.

Le présent compte rendu résume les discussions pertinentes de la réunion d'examen par les pairs et présente les modifications qui seront apportées aux documents de recherche connexes. L'avis scientifique et les documents de recherche complémentaires qui découlent de la présente réunion de consultation sont publiés sur le site Web du Secrétariat canadien de consultation scientifique du ministère des Pêches et des Océans.

INTRODUCTION

The meeting chair welcomed everyone and then explained how the Canadian Science Advisory Secretariat (CSAS) science peer review and advisory process works. The Terms of Reference (Appendix 1) were presented and the overall objectives of the meeting described. The contributors to the peer review are listed in Appendix 2. The plan was to develop two research documents from the working papers being reviewed during the meeting. The proceedings would document the relevant discussions and a science advisory report would summarize the main conclusions and advice from the meeting. The meeting generally followed the agenda described in Appendix 3.

An explanation of the Marine Protected Area Network (MPAN) was provided by the DFO Oceans program along with some background information on Canada's national and international commitments to the development of MPANs. Consultation with land claim organizations and other authorities/responsible jurisdictions would occur following this meeting. Oceans program received funding under the Health of the Oceans (HOTO), commencing in fiscal year 2014/201515, for an MPAN in the Western Arctic Bioregion. They plan to develop an action plan for the MPAN based on the science advice, and what they hear during consultations and discussions with co-management partners. DFO is tasked with leading the MPAN initiative under HOTO though other jurisdictions (e.g., Environment Canada [EC] and Parks Canada Agency) are responsible jurisdictions for some protected areas. After DFO finishes internal development of draft MPAN related documents, they will engage all other stakeholders, including other jurisdictions. DFO, Parks Canada Agency and Environment Canada are still on side to work towards the development of marine conservation areas, of one sort or another, but that collaboration will occur following the current step.

In the Western Arctic Bioregion, there is currently one established MPA, the Tarium Niryutait MPA. Another is expected to be designated in the next 12 months in the Anuniaqvia Niqiqyuam Area of Interest. Further development of a network will follow. The input from Science will identify more discrete areas on which to focus the next steps in MPAN development. The Science advice developed in this meeting will be considered along with future consultations and other activities so the Oceans Program can ensure their proposed MPAN is grounded on both scientific and traditional knowledge. Oceans Program also noted that they are currently calling proposed areas to be included in the MPAN "Conservation Areas" to assuage concerns that some stakeholders have about MPANs being solely about formal MPAs.

ASSESSMENT

OVERALL PROCESS USED TO ESTABLISH PRIORITY CONSERVATION AREAS

Presenter: Bob Hodgson

Presentation Summary

A more detailed explanation of the history of activities related to the Convention on Biological Diversity was provided. This international initiative is the foundation for Ocean Program MPAN activities and based on this international agreement, Canada is falling behind.

There are 13 bioregions in Canada; five of which occur in the Arctic (DFO 2009). The best data in the Arctic are available for the Western Arctic Bioregion and the best developed EBSAs also occur there. The Western Arctic Bioregion covers the Inuvialuit Settlement Region (ISR) and a small portion of the Nunavut Land Clams Area (NLCA).

The first step in the MPAN planning process is to identify EBSAs which are spatially isolated areas of importance. The second step is to use a classification system to delineate planning units covering 100% of the region. The third step uses steps 1 and 2 as primary inputs to identify sites called Priority Conservation Areas (PCAs) for MPAN planning.

Based on the minimum target goals PCAs must achieve at least 10% representativity of the total marine area. The individual PCAs should be scale appropriate; not too big or too small. A target size of 2,500 km^2 was proposed which when extrapolated would produce about 22 PCAs in the Western Arctic Bioregion. The PCAs must provide representativity of all EBSAs and eco-units with as much replication/redundancy as possible. The PCAs don't have to be the most critical or productive habitat but rather are strategically located to protect ecosystem form and function in the face of present and/or future threats.

PCAs are the first output of the MPAN planning process not the final product. Similar to Areas of Interest (AOI) in the planning process used to create individual MPAs, PCAs outline an area that meets the first stage requirements necessary for nomination for some level of conservation. The aim is a set of PCAs that capture areas of importance representing the spatial diversity of large scale ecosystem types. The level of conservation could be met in a number of different ways including but not limited to the development of MPAs or possibly fishery closures.

This meeting begins with step 2 in the process (i.e., the development of eco-units). This step must deal with data inconsistencies in a systematic way. The eco-units must achieve a minimum separation of realms (i.e., pelagic and benthic). They must be scale appropriate and reflect the dominant ecological drivers before subdividing further. They also should reflect stable, definable and spatially coherent ecological features, if possible, recognizing that environmental changes are occurring.

The approach taken in the working paper is that the eco-units would be one order of magnitude less than the Western Arctic Bioregion and one order of magnitude more than the PCAs. If the approach developed here works then it might be transferable to one or more other bioregions in the Arctic.

As a starting point for discussions a dichotomous key (or decision tree) was developed for the classification system using 11 input parameters, which were prioritized, to produce 17 classification units made up of 20 spatially isolated areas. These eco-units cover the entire Western Arctic Bioregion. Other classification systems have been attempted previously, for example Roff et al. (2003) used ice, climate regions and bathymetric for his classification system. Here the classification output was evaluated for representativity and replication. Representativity is the key to real world success of a conservation network. Both isolated areas of significance and the full spectrum of areas that capture the diversity within the environment need to be captured. EBSAs have to be represented and they account for a large majority of the PCA area (e.g., 73% in the draft working paper). The eco-units play a lesser role, making small adjustments to EBSA-driven PCAs and ensuring that PCAs outside EBSAs capture environment diversity.

Discussion

Overall Objectives of an MPA Network

- Participants noted that 10% is a minimum, not a maximum level, and we should not be aiming for the minimum.
- A participant pointed out that general management activities (e.g., fisheries management regimes) are insufficient to provide the protective measures needed.

- Dynamic aspects need to be considered and incorporated including larger scale changes (i.e., climate change related) as well as seasonal and short-term dynamics such as polynyas and sea ice edges must be considered.
    - The presenter asked how large and small scale variability might be incorporated into the delineation of static and 2-dimentional PCAs.
    - A participant responded that it is the coalescence of individual natural features and/or processes that result in specific phenomenon that are repeated and regular in occurrence. These phenomena are biologically significant and not static. If variability in the spatial extent of these phenomena is larger than the identified PCA then the value of that PCA is compromised. Neither seasonal nor inter-annual variability (e.g., <10 years) is captured in the current analyses.
    - Another participant indicated that representativity and replication refer to the ecological features not the seasonal aspects.
- With regard to EBSAs, a critical input to this process, it was suggested that there may be improvements necessary to define and map these areas. The approach we have taken to identify EBSAs has evolved but we may still not be satisfied with them.
    - The author responded that while that may be true we don't want the ongoing process being held up in order to get EBSAs perfect. Refinement of EBSAs can occur in step with the refinement of the PCAs and development of MPAs.
    - A participant noted that we are compounding problems with our EBSA delineation. We started with limited data, especially with respect to EBSA boundaries and compound the problem by adding other data such as temporal variability which increases the uncertainty. Compounding variance across multiple steps means that overall uncertainty could be huge.
    - One solution might be to increase the size of some PCAs to capture the variability. The author pointed out that the boundaries identified were approximate and we should not be limited by them. How Science wants to define the areas is most important while the exact locations of their boundaries are less so.
- It was noted that we are not the first in government to deal with time-varying features.
    - For example, tides have important influence on the development of charts. Ships are allowed to navigate up river during certain tides and not others to ensure adequate under-keel clearance. Shipping during ice-on seasons has shifted to a new system where the regulation of ship traffic is based on current conditions and ship capabilities as there is a reconnaissance and forecast system that monitors circumstances on the ground.
    - Trying to protect ecosystems with time-varying conditions may also need a surveillance system of this sort.
- Participants suggested that we have a starting point here for PCAs but recognize that the important things we want to conserve are dynamic and will potentially change over time.
    - One solution is a regular re-assessment process. For a large-scale phenomenon like climate change, re-assessment every decade might be adequate but for more short-term variability a shorter timeframe for reassessment would be needed.
    - The presenter indicated that there are ways to conserve areas with a review period built into the process but clear boundaries are needed in order to define and protect

an area. For MPAs there is supposed to be a review every five years to evaluate whether it is meeting its conservation objective(s). If not, then changes may be required.

- Participants suggested that corroborating data (e.g., Roff et al. 2003) should be left at that, not added into our analyses.
    - We shouldn't use someone else's synthesis in our analysis because we don't know exactly what assumptions they used.

ECOLOGICAL UNIT (ECO-UNIT) CLASSIFICATION SYSTEM

Presenter: Bob Hodgson

Presentation Summary

This presentation focussed on the biogeographic classification process. DFO (2012, 2013) provide examples of how to approach a classification system. The classification system must deal with data inconsistencies in a systematic way, the size and scale should be appropriate and, if possible, transferable for other bioregions in the Arctic. The approach being proposed is a "dichotomous key" identification system it builds on several classification systems already in place. This flexible system also allows more data-poor areas to be isolated and examined individually.

There are four steps in his classification process:

1. isolate clearly defined areas based on accepted scientific literature/knowledge;
2. select separation method for remaining area into pelagic/benthic or euphotic/aphotic or coastal/offshore
3. within areas delineated in step 2, further delineation may be needed based on "appropriate scale" and other obvious differences (e.g., climate, water sources); and
4. overall evaluation (checks and balance).

Discussion

- Participants had difficulty conceptually understanding the different terms, particularly EBSA versus eco-unit and PCA.
    - The presenter was asked whether we were just downsizing EBSAs as there are no new data to base new ecologically-significant areas.
    - Participants were reminded that this part of the meeting was focused on determining eco-units. The eco-units are meant to represent the biodiversity of ecosystems/habitats present in the Western Arctic Bioregion so it includes some areas not identified during the EBSAs process. The eco-units have to make up the entire Western Arctic Bioregion.
- The participants at the meeting would use their expertise to establish the eco-units, whether it is information on bowhead whale summer feeding areas or different types of ice.
- Experts that work on the lower trophic levels or geophysical elements often don't see their species/areas of study represented in EBSAs. The eco-units bring those less-obvious elements into the process too although it was pointed out by a participant that the higher trophic levels can act as a synthesis of the biological characteristics/processes operating at the lower levels.

- There was some concern expressed with the decision tree for eco-units classification as it is open to interpretation, thus it is too subjective.
    - For example, "dominant" in 4b of the decision tree could be defined differently by different people.
    - A dichotomous tree should be objective enough that different people will arrive at the same answer provided it is based on explicit information.
- There was another problem with the tree as there are no steps that would lead to step 4. Typically decision trees have options that will lead to closure or another step.

DATA USED IN THE CLASSIFICATION SYSTEM ANALYSIS

Presenter: Bob Hodgson

Classification System

- The presenter was asked if the defined classification system has to apply to each and every PCA/eco-unit or can they be defined individually on the basis of different criteria.
    - The intent behind the dichotomous key is to separate different categories of area (e.g., data-rich versus data-poor) while still following a systematic approach (in that all steps in the key are followed for all areas without exception). As a first step, the 'dominance' of an area (i.e., feature is broadly accepted in the scientific literature) can be applied easily based on agreed upon evidence from the literature. For the areas where there isn't a dominant feature, we need to be more consistent in our application of delineation inputs. We have the ability to change the protocol to better suit the classification process from a scientific perspective, but once the protocol is established, we need to adhere to it so that we have a systematic approach.
    - One participant suggested we need criteria for pre-selecting areas of interest from those that are irrelevant.

The working paper included a summary table of the eco-units. It shows the unit name and the primary source for identification of each unit as well as other sources of delineation and corroborating sources.

Areas influenced by the Mackenzie River

As a start, clearly defined areas should be delineated base on accepted scientific literature or knowledge. The first such area is that area influenced by the Mackenzie River. This was broken into the Mackenzie Estuary, Mackenzie Plume (maximum extent) and the Beaufort Shelf in the working paper. Two of the three areas were delineated based on varying influences of the Mackenzie River. The third area is beyond the maximum extent of the plume but still lies on the Beaufort Shelf.

- After much discussion participants agreed that the general area described in the working paper could be considered as three eco-units. The boundaries of the areas are difficult to define and whether these boundaries have biological significance is unknown. Clearly defining what is meant by the three areas is important.
- Participants agreed, not necessarily with the literature that was used, but that the three identified areas generally reflect differences in conditions like salinity, sediment loads and so on, that in turn reflect biological features of each area. But we can't agree on the exact outer boundary of the Mackenzie Estuary or the exact inner and outer boundaries of the

Mackenzie Plume and Beaufort Shelf because they would vary depending on the information criteria used (e.g., dinoflagellate distributions, bowheads distributions, etc.).

- Participants noted that the only static feature here is bathymetry thought defining features of the three areas are the combination of salinity and water temperature which is influenced by the outflow of the Mackenzie River and the buoyancy of layering freshwater over saltwater, as well as wind and ice during the ice-on season
- Participants were asked not get too focussed on where to set boundaries for individual eco-units but instead to highlight the uncertainties that currently exist. The Mackenzie-Beaufort region contains multiple EBSAs that capture the Mackenzie Trough and other areas of biological significance so perhaps we don't have to be overly concerned about not being able to carefully define our eco-unit boundaries right now.
- Rather than worrying about the boundaries between the plume and shelf, we may consider ensuring a PCA is positioned to span the extent of the three Mackenzie areas so that regardless of the location of the boundaries, the appropriate features will always be captured.
- The Beaufort Shelf break is an important area for marine mammals. We can say that using scientific opinion/expertise we generally defined three areas which can be dealt with later in the process. We just need to be clear about what sorts of biophysical features/parameters went into the decision. This was the same approach used to define EBSAs for the Western Arctic Bioregion.

Mackenzie Estuary

- During summer (end of July), at the end of the maximum freshet of the Mackenzie River, the 20 m isobath roughly corresponds to a salinity of 20 psu (at the complete mixing zone). We don't have the 20 psu data necessary to identify the two units. Further out from there salinities are higher at the bottom. Broad Whitefish and some other anadromous fishes don't go beyond the 20 m depth. The outer margin could probably be defined using salinity, sediment loads, etc., but the 20 m isobath can be used as a proxy for a number of these features. The estuary within 20 m is vulnerable to re-suspension during storms, where salinity drops to zero and where ice freezes to the bottom during winter.
- Participants agreed we should use the 20 m isobath as the defining feature for the estuary area. The 20 m isobath was only intended as a convenient proxy for other criteria which are biologically meaningful for the Mackenzie Plume. Data was collected in this area from the CCGS Nahidik.

Mackenzie Plume

- Participants noted that the plume pushes farther to the west or north of the area shown in the working paper, depending on wind. The publication used to define the extent of the plume was based on deposition of dinoflagellate cysts. It was meant to capture the maximum extent of the plume throughout the year. One participant suggested that sediment distribution might be used but another pointed out that you can rarely differentiate the estuary from the plume because the extent of it changes with time and direction. We don't know exactly what characteristic(s) or threshold(s) defines the plume.
- A participant suggested part of the solution is to acknowledge the Mackenzie Plume is a repeatedly present feature with a fuzzy outer boundary and a messy inner boundary. We could then pick a somewhat arbitrary area that with a high degree of certainty will contain the plume within the month of, say, July. If the new polygon is well within the plume (i.e.,

within the 95% probability of the plume extent) then we will achieve representativeness and some objectivity in the delineation.

- One participant asked if we need to be concerned about defending where within the maximum extent we put the minimum polygon. The presenter indicated that when we get to the step in the process where you place the PCAs, then the importance of where the minimum polygon should go becomes important.
- The Plume can vary hugely over very short time periods. Given this variability one participant suggest we define the eco-unit by bathymetry, which would encompass the plume area, not based solely on the plume feature.
- Participants pointed out that the Mackenzie Plume is not the only river that influences ice conditions and ecology in the Western Arctic Bioregion.
- The Tuktoyaktuk Shelf is influenced by the Plume. The 200 m isobath could be used as the outer boundary of the Beaufort Shelf and Mackenzie Plume areas combined, to the east of the Mackenzie trough. The area to the west of the trough might be considered for separate designation.
- One participant proposed removing the separate Plume area and combining it with the Beaufort Shelf. The author suggested that both the Plume unit and the Shelf unit are spatially appropriate in size. Other participants indicated that they should be separated on the basis of several types of available data: ice concentration, an approximation of ice thickness, a proxy for ice movement, salinity and suspended matter. This region is the one for which we have the best data so we should use it. The Plume area contains warmer and more turbid water while the Shelf contains cooler and less turbid water.
- Participants agreed to keep these units separate.

Coastal/Benthic

- A participant asked for clarification on the actual requirements we must adhere to for the classification system.
    - The language in the directive is as follow: "Develop/choose a biogeographic, habitat, and/or community classification system. This system should reflect the scale of the application and address the key ecological features within the area. This step will entail a separation of at least two realms – pelagic and benthic." Benthic-pelagic division may have come from the UN panel that deals with commercial fisheries.
- A participant asked if we are confined to using the UN's recommendation of "benthic" and "pelagic" for the "two realms".
    - If we apply benthic versus pelagic as criteria it will be less useful than using coastal versus offshore and more difficult to map on one map given the three-dimensional element of benthic-pelagic. The entire sea floor bottom is benthic. Others have interpreted this as a break-down between coastal and offshore. We can adopt the break-down that we want based on the scientific knowledge available (e.g., offshore, coastal, euphotic, pelagic).
- In the working paper, coastal versus benthic versus pelagic was evaluated using 50, 100 and 200 m isobaths and the distance that birds forage from the shore. In the scientific literature, 30 km is the most prevalent distance given but 50 km is also noted, so a 50 km conservative value was used to identify coastlines. Reviewers commented that the importance of birds in the Western Arctic Bioregion is restricted to the breeding season

and the offshore foraging distances for Northern Fulmar and Murres can reach up to 200 km. Nevertheless, there are no major seabird colonies in the Western Arctic Bioregion.

- Participants agreed that the 50 km buffer zone proposed in the working paper should not be used to define the coastal zone.
- One of the participants suggested we list the drivers that influence the differences we see between coastal and offshore areas.
- The coastal feature is importance for anadromous fishes and other species. Anadromous fishes use coastal areas within about 5 km of shore though the 20 m isobath around rivers (near communities that fish Arctic Char) has been identified for anadromous fishes in previous meetings.
- The 20 m isobath is also relevant with respect to ice scouring, influencing benthic communities, though sediment re-distribution is probably restricted to around the 10 m isobaths. Wind pushes the ice toward shore where piles it up until it reaches the bottom and scouring may occur.
- The 20 m isobath was used to define the Queen Maud Gulf EBSA.
- Participants noted that not all coasts are the same so we need to look at the most important driving features (e.g., ice).
- Participants agreed we should drop coastal versus offshore farther down the prioritization list than other drivers/factors.

- Participants agreed the 20 m isobath is an important feature throughout the Western Arctic Bioregion.
  - If we use it as a first-order proxy it will be different for the Beaufort (because the Mackenzie is such a dominant river with flow year round) than for the coastal waters around Melville and Prince Patrick islands where the rivers really only flow in summer.
  - The 20 m isobath coastal area may be subjected to ice scouring.
  - The 20 m isobath occurs over the entire area but will have different ecological conditions depending on the other ecological factors (e.g., freshwater inputs, temperature).
- Participants also agreed that there are three (not two) horizontal layers: pelagic, benthic and sea ice. We need to look at sea ice as both a driver and as habitat.

Offshore/pelagic

- A participant noted that the presence of Arctic Cod is related to water temperature (down to about 300 m). Arctic Cod is found in the 200-500 m depth zone in some areas of the Beaufort Sea, in 200-400 m depths in Franklin Bay and at the ice edge in spring near Ulukhaktok. Research conducted in the western Arctic found this species in waters warmer than 0°C.That said, our knowledge of Arctic Cod distribution is relatively data poor preventing us from identifying eco-units based on that species.

Ice features

- Three ice attributes that are important include ice presence, ice thickness and mobility (fast ice versus mobile ice).

- The CIS data is relevant for shipping where thinner ice is necessary, however, thin ice probably has biological relevance too.
- Participants recommended using some estimate of ice thickness as a criterion because thinner ice has a significant positive influence on epontic algae as well as for seals, whales and polar bears.

Polynyas

- East of the Mackenzie-Beaufort Shelf eco-units is the Bathurst Polynya.
  - Based on the Canadian Ice Service (CIS) ice data, synthesized for the past 30 years, April 30 was the most useful date for identifying the polynya complex. Based on further discussions with northern researchers and information from the scientific literature, the two main polynya areas were combined into one eco-unit in the working paper. Ice was used as a basis for mapping the Bathurst polynya in the working paper.
- A participant noted that polynyas consist of both open water and areas of thin ice (grey-white ice). More ecologically-relevant boundaries would be attained by including thin ice along with open water. Thin ice is important for local people as hunters in the region go out to hunt when wind acts on the ice to create openings.
- One participant thought that this mapping effort was highly subjective because it used average ice conditions for a single date in late April 30. More elements and dynamics need to be incorporated into the process.
  - A suggestion was made that it would be more useful to have a more detailed map that shows the variability (i.e., the "error bars") around the important features rather than just the 30-year average although another participant suggested the variability would be better described in the text because mapping variability would be difficult.
  - Another participant pointed out that the 30-year average for the ice data reveals very important areas but what is happening at the flaw lead off Banks Island is different from what is happening at the Cape Bathurst polynya suggesting that they should not be combined.
- Participants were reminded that a 30-year average doesn't tell us much about what will happen in any particular winter. If the ice is mobile, an open area may occur at the mouth of Dolphin and Union Strait but not near Cape Bathurst and so on, depending on the winter, which influences all the biological activity associated with open water and the associated thin ice. The darkest areas on the map probably reflect the maxima during about 50% of the years during the 30-year period. If we want to conserve, we can't just pick one area, we need all three.
  - The participants agreed to keep the three areas as separate components within one eco-unit.
- The three polynya complexes, which we could call Amundsen Polynya, and the two areas within Amundsen Pelagic which could be called Inner Basin and Outer Basin.
- Participants indicated that the 200-400 m depth zone (which seems to be associated with a slope drop-off), is important to Arctic Cod, continues from the Beaufort Sea into Amundsen Gulf so we should have an eco-zone representing that layer of water.

- We have three zones: a benthic zone, a pelagic zone and a surface zone where polynyas and flaw leads occur. These would overlap with the geographic eco-units that we had already defined for Amundsen Gulf.
    - However participants decided not to deal with depth components but to keep to two dimensions.
    - We need to indicate geographical overlap between the eco-units. The polynyas and flaw leads don't exist in the summer so they are strictly a seasonal presence. Although they could just be a seasonal presence within the Amundsen outer and inner basins, if we lump the three polynya-leads into one eco-unit we lose the opportunity for replication.
- A table should be included in the report showing each eco-unit and the criteria for each. We will decide on the final eco-unit names after a new map and table identifying overlap, seasonality and so on, has been developed.

Ice Pack

- In the working paper, the ice data for sea ice minimum in the fall was evaluated.
    - Between August 20 and September 3 there is a reduction in the 90% persistent ice whereas between September 3 and September 17 the persistence of ice increases. September 3 was chosen as a critical date for minimum extent of ice cover.
    - Based on those data Beaufort Sea pack ice northwest of Banks Island was identified as an eco-unit and an area of mobile ice that compacts along the northern coast of Victoria Island, called the Viscount Ice Pack eco-unit, was identified.
- A participant asked why all of the Beaufort Sea pack ice was not included.
    - The presenter indicated that the area farther offshore is not part of the Western Arctic Bioregion; it belongs to the Arctic Basin Bioregion. Participants wanted to know what features were used to define the boundary of the Arctic Basin Bioregion. No one at the meeting knew exactly what feature(s) were used as the boundary between the Arctic Basin and Western Arctic bioregions. O'Boyle (2010) indicates that the Arctic Basin was bounded by the 200 m depth contour.
    - Participants noted that the boundaries for the Western Arctic Bioregion should be included on all the maps.

Landfast Ice

- Landfast ice as habitat was mentioned during earlier EBSA meetings.
- A participant noted that Prince Albert Sound and Minto Inlet, as well as other large bays around Victoria Island, have similar value to species like seals due to the landfast ice.

Seabed morphology

- Seabed morphology (slope) was significantly different between Queen Maud Gulf and Coronation Gulf and the high slope areas wrapped around the Amundsen coast. This criterion also was used to establish the break-point in the Viscount ice pack.
- Participants thought that there are few soundings for Coronation Gulf. So for some areas it may be possible to use bathymetric features but not in other areas where the data are sparse.

PRIORITIZATION OF DATA INPUTS

- Eco-units may be identified because they contain homogenous features while other units may be defined by a single dominant ecological driver (e.g., the Mackenzie River) and yet other units may depend on several drivers.
    - A participant noted that we have a problem with seasonality because for much of the year the Mackenzie River is not a dominant driver. We should use several drivers to divide the Western Arctic Bioregion and then decide how to lump areas together. More data inputs to discriminate between units would make the final result more defensible especially since there is no one driv g factor.
- A suggestion was made to delineate units based on ensembles or clusters of influences, not dominant influences, which will help with the problem of seasonal variability.
    - Participants proposed several criteria for delineation of eco-units: benthic substrate, water circulation (e.g., strong tidal circulation) and unique habitats (which might be connected to substrates) regardless of how small they might be.
    - The presenter suggested that unique features should have been captured during the EBSA process.
    - A participant indicated that chemo-synthetic features have been found to influence the biological characteristics of an area. They would discuss outside of the meeting to see if chemo-synthetic features lie within the Western Arctic Bioregion (e.g., do they occur on the Beaufort slope?).
- The only dataset we have in terms of universal applicability throughout the Western Arctic Bioregion is ice data.
    - However, we do know of certain features (e.g., sills, ice types, substrate, upwelling, tidal mixing, polynyas) that can be used to define a region even though we might not know about it for the entire Western Arctic Bioregion.
    - Coastal boundaries were identified based on the high-tide mark.
    - The importance of the Beaufort gyre should be included. The boundaries of the Beaufort gyre would be determined via sea-surface slope or ocean current.
- The presenter suggested we first need to decide which data inputs, including expert knowledge, we want to use to identify eco-units to see what is left over and how the remaining areas might be divided up.
- When asked for clarification on scale, he indicated that the UN does not define size and scale. DFO has decided to work at the bioregion level (100,000s of km^2) and we know that classification units would be at the 10,000s of km^2 (one order of magnitude smaller) and the conservation areas are on the order of 1,000s of km^2 (another order of magnitude smaller). This was used as a rough guide for the working paper analyses.
    - We want eco-units to be large because species are mobile yet in some ways we want them to be small to capture hotspots. Lumping areas into a single unit is not particularly helpful; it's more conservative to split areas apart if we think a feature is present in each.
- One participant indicated that in some cases, extensive geographical data may not be available and there is likely also other information for which we might not have the data at this time.

- It was suggested that this should be captured in the Sources of Uncertainty section of the science advisory report. Features like temperatures, salinities, distributions of dinoflagellates, phytoplankton production, etc. could be used as proxies. However participants were encouraged to move beyond just discussing generalities.
- Sills were mentioned as available data inputs that should be included in the analyses. Sills are indicative of subsurface structure and dividing lines between water masses. They are like dams that don't come to the water's surface. A participant would provide the report author with coordinates of known sills.

- Participants suggested that more information is needed on ice conditions in these regions (landfast ice, black ice, multi-year and annual) before evaluating the eco-units, particularly evaluating landfast and multi-year ice.
  - Ice is classified in terms of its impact on shipping but also has some ecological relevance. The < 20 cm ice thickness category would probably be helpful for our purposes. The report author asked what date to use for the ice data relevant for the landfast (10/10) ice at the mouths of the big bays in the Amundsen Gulf area. A date in April was suggested by one participant and another suggested mid-June because of its relevance for summer productivity. From the perspective of ringed seal pupping, ice conditions around June 1 are most useful.
  - Another suggested ice persistence in big bays into July is also important. Though for places like Kugmallit Bay, ice clearance in late spring-early summer is most important to the ecology of the area.
  - The author agreed to look at ice conditions for the big bays in June, July and September.
- Capturing the extent of multi-year ice habitat is important; some mapping of this has already been done and should be incorporated into the analyses.
  - Multi-year ice will also be an important part of the Arctic Basin bioregion.
  - A participant suggested using October 1 for the ice data because that date is the birthdate of multi-year ice.
  - The working paper identified the ice minima for the past 30 years as September 3, as it is already growing by September 17.
  - The participant suggested, for representative ice coverage, the median rather than the minima should be used. Typically the multi-year ice fraction ranges from 30-80%. It was suggested that CIS data from the "median concentration of old ice" for October 1 should be used.
- Participants agreed that in addition to showing the boundary of the Western Arctic Bioregion in the maps, the eco-units that are contiguous to the Western Arctic Bioregion should be retained. We should reinforce the point in the Science Advisory Report that the boundaries of the Western Arctic Bioregion are inadequate because they don't reflect ecological considerations.
- Viscount Melville Sound extends down to about the 650 m isobath so the boundary of the Western Arctic Bioregion should extend out to at least that depth in the Arctic Ocean. Lease areas in the Beaufort extend down to about the 1,000 m isobath so perhaps the Western Arctic Bioregion should extend out to those depths. Bowhead feeding areas extend out to and slightly beyond the shelf break so she supports a boundary out to the 1,000-2,000 m isobath.

- In addition to gradients, (e.g., slopes off Banks Island and Mackenzie-Beaufort), we also need to think about corridors. It was suggested that PCAs for places where there are key corridors associated with significant biological activity should be identified.
- One of the participants indicated that the Canadian Hydrographic Service is developing a planning tool that layers different themes such as marine corridors, radii for marine rescue response times, the 50 m isobath for navigation and the status of hydrography. Once the proposed PCAs get nailed down, the shape files should be added to the CHS database so this information can be incorporated into their planning. CHS plans to conduct work in the *thalweg* (i.e., deepest waters of the channel) of southeastern Dolphin and Union Strait in summer 2014.

Participants agreed in principle to the following eco-units:

Coastal zone

- coastal unit out to the 20 m depth contour around the entire Western Arctic Bioregion
  - where appropriate as an eco-unit or where not, as a data input
  - area used by anadromous fishes
  - proxy for the fish community: for nearshore habitat use by anadromous fishes where they occur and for nearshore marine fishes (euryhaline and eurythermal fishes), such as Saffron Cod
  - impacted by ice scouring
  - Arctic Char rivers throughout the region
  - 20 m isobath along the south side of Melville Island will only be about 5 km wide due to the steep slopes there
  - coastal area includes around the M'Clure-Parry-Viscount Melville area

Mackenzie Estuary

- 20 m depth used as the estuary boundary
- Coincides with freshened/fast ice zone

Mackenzie Plume

- Can be defined as a mixing zone
- Coincides geographically with the mid-shelf

Beaufort Shelf

- Would actually only capture the outer-shelf
- shelf break off the Mackenzie is at about the 80 m isobath. The shelf break is the position on a cross-shelf topographic transect where the bottom slope is changing most rapidly. The depth of transition varies along the shelf edge.

Amundsen pelagic

- includes the distribution of bowheads, beluga and seals

Amundsen polynya/flaw lead complex

- three polynya-flaw lead areas (as presented) treated as separate components under one classification unit
- includes the Cape Bathurst polynya
- includes the inner and outer basin of Admundsen. There is a sill NNW of Cape Parry which separate the outer basing (to the west) from the inner basin (to the east).

Amundsen Gulf -large bays

- deeper portions (>20 m) of the four big Amundsen bays (Franklin, Darnley, Prince Albert and Minto Inlet bays) in the Amundsen Gulf area
- the ice edge (landfast 10/10 ice) for the four bays needs to be mapped using CIS data to delineate the cut-off for the mouth(s) of the bays
- supported by marine mammal use/distribution

Prince of Wales Strait

- separate eco-unit because it is consistently used as a travel corridor by seals, whales and Polar Bear
- supported by seal tagging
- doesn't seem to be used as an area for feeding
- used in the summer for migration by marine mammals to Viscount Melville Sound
- sill at the north end of the strait
- ice may be used as a discriminator (landfast) and to define the southern end of the strait

Banks Island Slope

- strips following depth contours off western Banks Island
- bounded by western edge of the Western Arctic Bioregion
- includes the slope gradient
- shelf break off western Banks Island is at about the 500 m isobath and would therefore be in the Arctic Basin Bioregion

Beaufort Sea Pack Ice

- western end of M'Clure Strait as defined by ice data presented

Western Parry Channel (M'Clure Strait)

- first-year versus multi-year ice analysis will be important in defining the units in this area
- western end defined by the Beaufort pack ice
- multi-year ice contributes to the eco-unit

North Victoria Island Shelf (Viscount Melville Sound ice-pack)

- north Victoria Island
- distinguished from Western Parry Channel by ice data (persistent late season ice) and bathymetry (deep basin cut off from main channel by a large ridge)

M'Clintock Channel

- separate out the 20 m isobath coastal unit, as there is elsewhere
- Remainder distinguished by ice data, ice jams
- differs from Peel Sound primarily due to persistence of ice year-round
- two sills at the north end of McClintock Channel
- no oceanographic measurements for McClintock because until recently no one could get a ship through there due to extensive multi-year ice
- used by Polar Bears
- Ommanney Bay area (Prince of Wales Island) is included
    - landfast ice area
    - dissimilar from the Amundsen Gulf area large bays

Franklin Bay/Larsen Sound

- area of upwelling and tidal mixing
- ice clears out of this area
- Whales use Franklin Strait and Peel sound (and Bellot Strait) for migration and the bays along the eastern coast of Prince of Wales Island

Coronation Gulf and Queen Maud Gulf

- may be too few bathymetric data to separate into two eco-units

- may be a choke point at the eastern end of Dease Strait
- the fast tidal currents are in Simpson Strait on the south side of King William Island
- seals tagged near Ulukhaktok have overwintered in Bathurst Inlet
- lots of Arctic Char movements in this area as well
- freshwater inputs in the form of the Coppermine River, which flows into Coronation Gulf, and the Back River, which flows into Queen Maud, may separate the two areas

Dolphin and Union Strait

- ice break-up data available for delineating the mouth (northwestern end)
- northern boundary should be towards the fast ice (not mobile ice)
- both ice data and a sill were used to delineate the southeast end of the strait

The working paper author will update the eco-units based on the meeting discussions. Then a teleconference call will be held to make sure everyone if agreeable with the new eco-units. An updated working paper will be circulated before the call.

A participant suggested caution in how we name eco-units if we use a number of attributes to define an eco-unit rather than just using one driver (e.g., Mackenzie Plume).

INTRODUCTORY OVERVIEW OF PCAS

Presenter: Bob Hodgson

The third step (as identified by the UN/CBD MPAN planning) in the process was summarized. Qualitative and/or quantitative techniques will be used to identify priority conservation areas to include in a network. We will use EBSA and classification units as primary inputs and address the requirements of ecological coherence through representativity, connectivity and replication. Ultimately, the fourth step will assess the adequacy and viability of the selected sites though we are not there yet. There are 24 EBSAs covering 47% of the Western Arctic Bioregion with 73% of the proposed PCAs falling within EBSAs. The proposed eco-units cover 100% of the Western Arctic Bioregion. The working paper had 17 eco-units which may change based on our discussions covering the remaining 27% of PCAs outside the EBSAs.

PCAs must achieve at least 10% representativity of the total marine area (~ 55,000 km^2). They must be scale appropriate, thus a target size of about 2,500 km^2 would be about right. The PCAs must have representativity of all EBSA and all eco-units. Their focus is not necessarily to capture the most critical, most important or most productive areas. Representativity is the key. We must capture isolated areas of significance and a spectrum of areas that capture the diversity within the environment. EBSAs account for the large majority of the PCA area; the classification units play a lesser role. PCAs are only an intermediate step, not the final product.

Areas within the Western Arctic Bioregion where multiple EBSAs and multiple eco-units overlap were identified. This analysis indicated areas that would help contribute to a network of PCA that have replication of EBSAs and eco-units. The polygons identifying PCAs in the second working paper will have to be updated based on changes to the eco-units resulting from our meeting discussions.

Discussion

- Participants asked for clarification on why some eco-units (in particular Beaufort Pack Ice) have such a low level of representation.
    - The author noted that the Beaufort Ice Pack eco-unit occurs in only a very small portion of Western Arctic Bioregion; it is more highly represented in the Arctic Basin Bioregion and will therefore have a higher representation when that bioregion is the focus of planning.

- Participants were reminded that the two scientific inputs to the MPAN planning process are EBSAs and eco-units. The two datasets were overlaid but the initial results weren't that useful. We have to hit the hotspots and that contributed to capturing quite a few PCAs. Existing conservation areas were also considered (e.g., Banks Island Migratory Bird Sanctuaries, Ivvavik National Park) in identifying PCAs. Other areas within the Western Arctic Bioregion that communities would like to conserve were included. Participants did not think this was appropriate at this stage of the process.
- One participant suggested that the placement of the PCAs was not based on Science so position of the PCAs should not be evaluated.
    - So for example one participant suggested the proposed Hadley Viscount PCA does not capture the biological hotspot within the Viscount Melville Sound region.
    - The author indicated that it doesn't have to.
    - Another participant suggested that we need to do a "checks and balance" step to see how well the EBSAs and eco-units overlap. After the analyses have been rerun based on our earlier discussions, the participants will have to consider whether they really capture the areas we believe have ecological significance.
    - Science doesn't select the final group of PCAs but we should be able to identify a set of PCAs, with options, that we think are most suitable for the conservation of all habitats/ecosystems present in Western Arctic Bioregion that we know of.

Participants suggested several areas need to be added to the proposed set of PCAs:

1. the flaw lead-polynya system (eastern Beaufort-Amundsen Gulf?) in the spring;
2. the middle of Viscount Melville Sound about where the word "Hadley" appears in Figure 15 of the PCA working paper;
3. Pierce Point (northeast Darnley Bay); and
4. the area north of about McKinley Bay (eastern Tuktoyaktuk Peninsula?)
5. the Uluhaktok PCA would benefit from being expanded much farther into Prince Albert Sound.

- A participant asked if the PCAs shouldn't be larger so they cover more of the EBSAs.
    - The author indicated they are already the driving force since 73% of the PCAs fall within the EBSAs. It was also suggested that the 50 km x 50 km (2,500 km^2) window used to delineate PCAs could be enlarged.
    - Participants wondered if fewer PCAs of a larger size that would be preferable to more PCAs of the present size.
    - The author would run one bigger and one smaller window sizes to test what effect having larger or smaller PCAs would have on replication or representativity.
- A participant suggested having the PCA cut across the Beaufort Shelf to catch all three eco-units in that area.
    - The report author had tried to keep the eco-units close to the same size. However there will be quite a bit more variation in the sizes of the new PCAs once he has rerun his analyses based on the participants' recommendations. He added that the updated eco-units will be significantly more skewed than the ones presented in his working papers.

- Participants wanted to better understand how the PCAs will be used.
    - The author indicated consultations will help to identify who will take responsibility for PCAs. For example, if Parks Canada Agency decided to take responsibility for 10% of the PCAs they might change the boundaries of those areas based on their concerns. They would also decide what tools are used for management/protection of those areas. The mosaic of "conservation areas" will be presented to the UN to demonstrate Canada's commitment to meeting the 10% goal for conservation. On the ground we will try to connect these areas together.
- Participants asked how the identified PCAs will have a real impact on protecting species that are mobile.
    - Participants agreed that they would be more effective if they were larger so they offer a more holistic approach to conservation, rather than a bunch of little boxes. The decision to select PCAs in the size range of 2500 km^2 is based on management considerations not scientific criteria. This is why scientists are concerned about this approach.
    - The author planned to run the PCA analysis on multiple scales, both bigger and smaller, to see what impact that has. Ultimately, the final size will be based on a variety of inputs not just scientific. Science doesn't have to worry about whether we recommend sizes of PCAs that are larger than what others might like.
    - Participants were cautioned that if we make the PCAs significantly larger then it is likely fewer areas will receive protection.
- One participant said if we have a shape for an area, it will apply year-round not seasonally even though it may have more or less importance for different seasons depending on the area.
    - We recognize there is seasonality for almost all areas in the Western Arctic Bioregion and that uncertainty will have to be explained in the text.
    - One participant suggested having a summer overlay and a winter overlay to make our maps more dynamic. The author indicated that after the first proxy, the 20 m isobaths, there could be a secondary split based on seasonality. The rationale for each distinct area should be highlighted, presumably in a hierarchical approach, indicating the primary and secondary criteria used. For areas with seasonality, we should indicate that in our descriptions and for areas for which we don't think (or don't know if) there is seasonality, then we should note that too.

Participants agreed to review the eco-units once the analyses have been updated. We did not get to a detailed discussion about individual PCAs as we decided that the eco-unit analyses will need to be updated based on some new inputs. The report author will do some sensitivity "moving window" analysis for the PCAs. For the Beaufort and western Banks Island regions we agreed that we need a PCA out from shore that crosses the ranges of slopes.

- Participants suggest upwellings are an important source of information.
- If you look for places where the slope drops off quickly, that will identify where the marine mammal hotspots are. For examples: the east side of Bathurst Peninsula, Pierce Point, the shelf break of the continental shelf, the Yukon Coast, Kugmallit Canyon and the Mackenzie Trough. However, most of these are captured in the EBSA process.
    - The working paper includes the slope information, but the author indicated that he can't make the inference himself.

- Another participant said that forcing on the ocean – by winds from the eastern sector which drive surface water offshore and results in deeper water moving onshore – is conducive to upwellings. So both topography and impetus from the atmosphere contributes to upwellings.
- A participant offered to provide the scientific interpretation needed.
- Evidence of marine mammal hotspots combined with knowledge of a combination of features can be used together as an inferred conclusion about the importance of an area. This is different than cases where inference is not required. We should distinguish between these in the working papers so it is clear how we reached our decisions.

- A participant wondered if instead of trying to separate different areas using different forcing factors, we define the forcing factors present for different regions and concern ourselves less about defining specific boundaries.
- After discussing various terms participants ultimately agreed to use "eco-units". We would be clear that we used a different process to define them than we did for EBSAs.
- Participants compared the list of EBSA names with the proposed eco-unit names. It will be confusing if the names are the same.
  - Participants suggested that we should be consistent with our naming convention. Geographic names identifying where the eco-unit is located combined with something very general which does not describe processes because there are a suite of processes operating in each area. For example, a participant suggested Mackenzie Coastal Zone, Mackenzie Mid-zone, and Mackenzie Outer Shelf for the three areas, and this approach would be transferable elsewhere. Participants agreed with this suggestion.
  - A suggestion was made to use the name polynya-flaw lead complex with a geographical name for each of the three components.
  - We need to explain in the text how the data are used for this process (i.e., contributing or separating (delineating) eco-units).
  - One participant indicated that community TEK indicates there are leads near every community and where they hunt. By focussing on Cape Bathurst it just sounds like there is only one lead system. A participant suggested dropping the name Cape Bathurst and keep flaw lead.
  - The Amundsen Pelagic zone would now be the Amundsen Inner Basin. One participant pointed out that if only one PCA comes out of this process that it's one that captures Cape Bathurst polynya due to its ecological importance.
- One participant pointed out that the EBSA map needs to be updated in the report, there is just one EBSA in Viscount Melville Sound not two, in the deep basin of the Sound following a bathymetric line.
- Position of PCAs relative to the overlap of EBSAs and eco-units need to be checked to ensure that the area identified actually captures the areas we think they should. Participants were reminded that the most important/critical areas do not have to be proposed. That said, we will conduct an evaluation of the final list of PCAs following the update. Participants may want to identify more than just 10% and document why/how we did it. The working paper should address what are considered the desirable attributes of each PCA from an ecosystem perspective.

- A participant pointed out that we have identified PCAs from the information that we know. But there are big areas on the map that are blank such as around Melville and Prince Patrick islands. Those areas were missed in the EBSA process but won't be in this eco-units process.
- A participant asked why the proposed Hadley Viscount PCA runs from the coast outward but doesn't capture the deep portion of Viscount Melville Sound.
    - The author had tried to capture a range of slopes but would look at the issue of missing the deep portion of the Sound.
- The northern end of the west coast of Banks Island is more important for marine mammals (certainly for bowheads and polar bears) than farther south.
    - One participant suggested moving the Banks Slope PCA northward. The chair suggested we might want to leave it where it is but add another PCA at the north end of western Banks Island. The author would look at whether to move or add based on his re-analysis.
    - The author said we have to account for the fact that we are using scientific input from EBSAs and eco-units and try as much as possible to stick to those inputs and avoid one-off inputs to this process.
- Participants noted that there are missing areas. The implication is that if there wasn't specific information available then an area was left out. This is a science-based process that will result in a number of PCAs based on biological and ecological criteria. We should include all the areas we think are important from a biological/ecological perspective. We should not worry about socio-logical/economic issues. If we haven't included areas we should, then we will. We will neither restrict their size nor shape.
    - We will remove the management concerns identified in the working papers. However if we identify ten PCAs in one area but one or more is more important than others then we should be clear about their higher priority. If the new maps don't include key areas then perhaps we will need to adapt the process so that it produces the desired results.

CONSERVATION OBJECTIVE

Participants discussed the conservation objective for the MPAN for the Western Arctic Bioregion and agreed to the following:

> *The Marine Protected Area Network is established to ensure as much as possible that ecosystems and ecosystem services of the Western Arctic Bioregion remain healthy and productive for future generations. This will be accomplished by enhanced management including ongoing knowledge acquisition such that all ecological diversity and ecologically significant areas are represented thereby providing better knowledge and adequate management options to deal with future changes and pressures. Explicitly this includes all four levels of diversity of the UN CBD.*

SCIENCE ADVISORY REPORT

Information to be included in the science advisory report was noted. A general description of the type of summary bullets needed was identified. The report will include why we went with the dichotomy of coastal versus offshore rather than the benthic versus pelagic suggested by the UN.

NEXT STEPS

The Chair indicated we would reconvene in the future via teleconference to discuss revisions. We will not include additional people only those that have already had input in the process. Most participants indicated they would be available towards the end of May but not earlier that month. The revised papers would be distributed two weeks prior to the teleconference call. Participants were identified as "go to" people for the report author should he need help with his re-analyses. Incremental revisions would be sent out so there would be less to review prior to the teleconference call.

All meeting participants were thanked for their contributions during the meeting.

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APPENDIX 1: TERMS OF REFERENCE

Developing a marine protected area network in the Western Arctic Bioregion – validating the process and identifying Priority Conservation Areas

Regional Peer Review – Central and Arctic Region

February 17-19, 2014
Winnipeg, MB

Chairperson: Kathleen Martin

Context

To meet Canada's obligations to the United Nations Convention on Biological Diversity (UN CBD), a Marine Protected Areas Network following UN stipulated steps is required. The objective of the network will be to help conserve biodiversity, ecosystem functions and natural characteristics of the marine environment. Ecologically and Biologically Significant Areas (EBSA) have been identified for the Western Arctic Bioregion. The next step in the process is to identify ecological units derived from a biogeographic classification system. EBSAs and ecological units are used as inputs to identify priority conservation areas as planning inputs to the Marine Protected Areas Network.

Fisheries and Oceans Canada (DFO) Science was asked to peer review a proposed classification system to produce ecological units and identify a conservation objective and priority conservation areas.

Objectives

The purpose of the meeting is to answer the following question:

> Do the proposed Priority Conservation Areas capture the most appropriate set of areas in the Western Arctic Bioregion given the criteria (i.e., representativity, connectivity, replication, and feasibility) and purpose (i.e., enhanced management areas to promote/allow for sustained ecosystem function and resilience) of areas to be selected for a Marine Protected Area Network?

This will be addressed by answering the following questions:

1. Do the proposed eco-units capture the necessary scale and division of ecological units (primarily based on physical habitat criteria) needed?
2. Does the set of Priority Conservation Areas capture a balanced and appropriate set of representative areas?
3. Will connectivity and replication be maximised once representativity is achieved?
4. Does the overarching conservation objective capture the nature and intent of the network given the proposed Priority Conservation Areas?

The following two working papers will be the basis of the peer review:

Working Paper 2014a: Marine protected area network planning in the western Arctic bioregion: Identification of a conservation objective and priority conservation areas as required planning components, by Hodgson, R.

Working Paper 2014b: Marine protected area network planning in the western Arctic bioregion: Development and use of a classification system to produce ecological units as required planning components, by Hodgson, R.

Expected Publications

- Science Advisory Report
- Proceedings
- Two Research Documents

Participation

- Fisheries and Oceans Canada (DFO) (Science, and Ecosystems and Fisheries Management sectors)
- Environment Canada (Canadian Wildlife Service and Canadian Ice Service)
- Nunavut Wildlife Management Board
- Fisheries Joint Management Committee
- Canadian Museum of Nature
- Academia
- Other invited experts

APPENDIX 2: PARTICIPANTS

Name	Affiliation
Holly Cleator (Rapporteur)	Fisheries and Oceans Canada, Science
Kathleen Conlan†	Canadian Museum of Nature
Lois Harwood	Fisheries and Oceans Canada, Science
Bob Hodgson	Fisheries and Oceans Canada, Oceans
Jerry Inglangasuk	Fisheries Joint Management Committee
Lisa Loseto	Fisheries and Oceans Canada, Science
Kathleen Martin (Chair)	Fisheries and Oceans Canada, Science
Humfrey Melling	Fisheries and Oceans Canada, Science
Christine Michel	Fisheries and Oceans Canada, Science
Steve Newton	Fisheries and Oceans Canada, Oceans
Andrea Niemi	Fisheries and Oceans Canada, Science
Joclyn Paulic	Fisheries and Oceans Canada, Oceans
Jim Reist	Fisheries and Oceans Canada, Science
George Schlagentweit‡	Fisheries and Oceans Canada, Canadian Hydrographic Service
Paul Smith†	Environment Canada
Wojceich Walkusz	Fisheries and Oceans Canada, Science

†provided comments on the working papers in advance of the meeting
‡participated by teleconferenc/WebEx

APPENDIX 3: AGENDA

Developing a marine protected area network in the Western Arctic Bioregion – validating the process and identifying Priority Conservation Areas

Regional Peer Review – Central and Arctic Region

February 17-19, 2014
Winnipeg, MB

Monday 17 Feb 2014

1:00 p.m. Meeting introduction (K. Martin)

- CSAS process
- Participant introductions
- 1:30 p.m. Background and review of meeting purpose via draft papers (B. Hodgson and K. Martin)
- National and International commitments to Marine Protected Areas Network (MPAN)
- Stages of MPAN Planning
- Goals of this 2013/14 CSAS process
- Overview of work done (draft papers)
- Terms of Reference
- Agenda

2:15 p.m. Overall process used to establish Priority Conservation Areas (PCA)

2:45 p.m. BREAK

3:00 p.m. Process (classification system) used to create UN step 2 delineation units

4:00 p.m. Data used in the classification system analysis

5:00 p.m. Day 1 wrap-up

Tuesday 18 Feb 2014

9:00 a.m. Prioritisation of data inputs

10:00 a.m. Proposed list of UN step 2 delineation units

10:30 a.m. BREAK

10:45 a.m. Introductory overview of PCAs

12:00 p.m. LUNCH

1:00 p.m. Steps and process to produce PCAs

2:00 p.m. Evaluation of PCAs

2:45 p.m. BREAK

3:00 p.m. Proposed list of PCAs

5:00 p.m. Day 2 wrap-up

Wednesday 19 Feb 2014

9:00 a.m.	Review of meeting decisions, resolutions and recommendations (K. Martin)
9:15 a.m.	Science Advisory Report review (K. Martin)
10:30 a.m.	BREAK
10:45 a.m.	Science Advisory Report review continued.
11:45 a.m.	Concluding remarks (K. Martin)
12:00 p.m.	Meeting Complete – THANK YOU!